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**Kim et al.**

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(54) **DEPTH PIXEL INCLUDED IN  
THREE-DIMENSIONAL IMAGE SENSOR,  
THREE-DIMENSIONAL IMAGE SENSOR  
INCLUDING THE SAME AND METHOD OF  
OPERATING DEPTH PIXEL INCLUDED IN  
THREE-DIMENSIONAL IMAGE SENSOR**

(58) **Field of Classification Search**  
CPC ..... G01S 7/4863; G01S 17/10; G01S 17/89;  
H01L 27/14643  
See application file for complete search history.

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*Primary Examiner* — Luke Ratcliffe

(74) *Attorney, Agent, or Firm* — Volentine & Whitt,  
PLLC

(57) **ABSTRACT**

A depth pixel of a three-dimensional image sensor includes a first photo gate which is turned on/off in response to a first photo control signal, a first photo detection area configured to generate first charges based on a received light reflected from a subject when the first photo gate is turned on, a first transmission gate which is turned on/off in response to a first transmission control signal, a first floating diffusion area configured to accumulate the first charges generated from the first photo detection area when the first transmission gate is turned on, and a first compensation unit configured to generate second charges which are different from the first charges based on ambient light components included in the received light to supply the second charges to the first floating diffusion area.

**23 Claims, 42 Drawing Sheets**

(71) Applicant: **SAMSUNG ELECTRONICS CO.,  
LTD.**, Suwon-si, Gyeonggi-Do (KR)

(72) Inventors: **Seoung-Hyun Kim**, Hwaseong-si (KR);  
**Yoon-Dong Park**, Osan-si (KR);  
**Yong-Jei Lee**, Seongnam-si (KR);  
**Joo-Yeong Gong**, Suwon-si (KR);  
**Hee-Woo Park**, Seoul (KR);  
**Seung-Won Cha**, Daejeon (KR);  
**Sung-Chul Kim**, Hwaseong-si (KR)

(73) Assignee: **Samsung Electronics Co., Ltd.**,  
Suwon-si, Gyeonggi-do (KR)

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**H01L 27/146** (2006.01)

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CPC .... **H01L 27/14612** (2013.01); **H01L 27/1461**  
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